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AUTHOR Richards, Ruth L.; And Others
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ABSTRACT

Although previous studies support familial and individual relationships between creativity and affective illness, most have examined eminent creative individuals. This is the first study of creativity in subjects defined only by psychodiagnostic criteria. Creative accomplishment over the adult lifetime was assessed broadly using a new instrument, The Lifetime Creativity Scales, developed and validated for this research. Subjects were persons involved in a Danish adoption study. There were 44 index subjects (17 manic-depressives, 16 cyclothymes, 11 normal first-degree relatives) and 33 controls without a personal or family history of major affective disorder or cyclothymia (15 normal, 18 carrying another diagnosis). Orthogonal contrasts showed that normal and ill controls did not differ significantly from each other on creativity, but that creativity was higher in all index than control subjects and higher in normal relatives than in manic-depressives. Vocational and avocational creativity were also considered separately. Findings suggest that enhanced creativity may represent a compensatory advantage among individuals at risk for manic-depressive illness. (Author/NB)

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Creativity in Manic-Depressives, Cyclothymes, Their Normal Relatives, and Control Subjects

Ruth L. Richards and Dennis K. Kinney

Laboratories for Psychiatric Research

McLean Hospital and Harvard Medical School

Inge Lunde

Psychological Institute

Kommunehospitalet, Copenhagen, Denmark

Maria Benet and Ann P.C. Merzel

Laboratories for Psychiatric Research

McLean Hospital, Belmont, Massachusetts

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Running head: CREATIVITY AND MANIC-DEPRESSIVE LIABILITY

Abstract

Most previous studies of creativity and affective illness have examined eminent creative individuals. This is the first study of creativity in subjects defined only by psychodiagnostic criteria. Creative accomplishment over the adult lifetime was assessed broadly using a new instrument, The Lifetime Creativity Scales, developed and validated for this research. There were 44 index subjects (17 manic-depressives, 16 cyclothymes, 11 normal first-degree relatives) and 33 controls without a personal or family history of major affective disorder or cyclothymia (15 normal, 18 carrying another diagnosis). Orthogonal contrasts showed that normal and ill controls did not differ significantly from each other on creativity, but that creativity was higher in all index than control subjects ($p<.05$) and in normal relatives than in manic-depressives ($p<.10$). Vocational and avocational creativity were also considered separately. Findings suggest that enhanced creativity may represent a "compensatory advantage" among individuals at risk for manic-depressive illness.

Creativity in Manic-Depressives, Cyclothymes, Their Normal Relatives, and Control Subjects

Although previous studies support familial and individual relationships between creativity and major affective disorder (for reviews, see Andreasen, 1978; Richards, 1981), they: (a) have used subjects selected on the basis of creativity, not psychopathology, and/or (b) have been limited to socially recognized creative accomplishment, usually in specific fields. Thus the generality of previous research findings is limited in several important respects. If, in fact, advantages related to creativity do occur broadly among subjects at risk for affective disorders, a large proportion of the population could be affected. The present study considers creative accomplishments over the adult lifetimes of manic-depressives, cyclothymes, and their psychiatrically normal first-degree relatives; it is the first general study of creative accomplishment within groups defined solely by psychodiagnostic criteria.

There is support for an increased prevalence of endogeneous psychosis (including manic-depressive illness, schizophrenia, and undetermined psychosis) in the relatives of artists and scientists (Juda, 1949), and for a higher prevalence of major affective disorder in the relatives of creative writers than in the controls (Andreasen & Canter, 1974). In the only previous research to begin with subjects identified by psychopathology rather than creativity (Karlsson, 1970), social recognition for artistic or scientific work occurred more frequently in the families of psychotics than in families of controls.

Examination of the data shows that the relatives of manic-depressives contributed more to this pattern than did the relatives of schizophrenics (Andreasen, 1978; Richards, 1981). In a related study of extensive pedigrees (Karlsson, 1968, 1970), the same family branches tended to be high in both psychosis and socially recognized creativity. An adoption study (McNeil, 1971) supported genetic, but not environmental, mediation between the level of socially recognized creativity in adoptees and the amount of psychopathology in their parents; there are indications that affective disorder was important to this relationship (Richards, 1981).

Among the adoptees themselves, McNeil (1971) found a significant positive relationship between creative ability and the prevalence of psychopathology; diagnoses all fell in the category of personality disorder or "constitutional psychopathy." Other investigations of creators' own psychopathology found elevated levels of psychosis (Juda, 1949) and major affective disorder (Andreasen & Canter,1974; Jamison, in press) compared to control or general population levels. These findings are supported as well by diagnostic data on creators from a number of uncontrolled studies (see Andreasen, 1978; Richards, 1981). However, in all but one previous study (Andreasen & Canter, 1974), the typical creator either carried a milder diagnosis or was considered psychiatrically normal.

There is good reason to expect that a number of milder psychiatric disorders may have been missed in most previous research; only Andreasen and Canter's (1974) study employed direct personal interview to

determine diagnosis. In addition, no previous study has considered family psychiatric history along with the creators' own psychiatric condition; family history might have been of particular interest for the less-disordered creators.

A number of considerations suggest that: (a) affective disorder may carry particular advantages for creativity, but that (b) these benefits may be greater in the milder rather than more severe manifestations of affective disorder. Several potential advantages of a mild hypomanic state have been proposed (Richards, 1981). In the third edition of the Diagnostic and Statistical Manual of Mental Disorders, or DSM-III (American Psychiatric Association, 1980), two of the criteria for the hypomanic phase of cyclothymic personality disorder involve (a) sharpened and unusually creative thinking and (b) increased productivity. Cyclothymic personality was a frequent second diagnosis in Andreasen and Canter's (1974) study of eminent creators, and hypomanic symptomatology was also found frequently in Jamison's (in press) sample. There is evidence that cyclothymia may represent a milder manifestation of bipolar liability; for instance, cyclothymic personality is more prevalent in relatives of manic-depressives than relatives of unipolar depressives and controls (Weissman et al., 1984). Richards (1981) proposed that the creativity of some psychiatrically normal creators may be facilitated by subclinical factors related to a family history of major psychiatric disorder.

The present study examined whether creativity is an "inverted-U" function of the degree of manifest bipolar psychopathology in

individuals at risk for manic-depressive illness: (a) individuals with frank manic-depressive illness were expected to manifest an intermediate mean level of creativity, (b) cyclothymes to have the highest mean creativity, and (c) the psychiatrically normal first-degree relatives of manic-depressives or cyclothymes to show intermediate creativity. (Although normal relatives who carried genetic liability for bipolar disorder were expected to be particularly creative, our sample of normal relatives was assumed to be heterogeneous for such liability, since it is unlikely that all of these relatives would have inherited genes conferring liability). In addition, these three index groups combined were expected to show higher creativity than a group of control subjects lacking any personal or family history of major affective disorder.

It was also hypothesized that the inverted-U pattern would persist after the effects of age, education, and intelligence were partialled out of creativity scores. Variables related to education and intelligence would be expected to show positive associations with creativity (Barron, 1969; Richards & Casey, 1979; Barron & Harrington, 1981); such factors may enhance the realization of creative potential and should not be regarded merely as nuisance variables. However, the projected differences in creativity between groups, if meaningful, should not be fully explained by such factors (e.g., Getzels & Jackson, 1962). Previous studies of associations between creativity and psychopathology have not taken these variables into account.

Thus the present study is distinguished in several respects from most previous research on creativity-psychopathology relationships. In

addition to providing (a) the first general study of creativity in psychodiagnostic groups defined by psychiatric diagnostic criteria, the present research (b) considers both the individual and the family psychiatric history of subjects, and (c) uses data from personal interviews as the basis for assessing both psychiatric status and creativity of the primary study subjects. Use of (d) a new and broad-based measure of adult creative accomplishment with high interrater reliability and multiple indications of construct validity -- The Lifetime Creativity Scales -- made this study possible. Finally, (e) appropriate controls were instituted for variables such as education and intelligence.

Methods

Sample and Diagnostic Data

The 77 subjects in the present study were all persons who met our diagnostic criteria among those previously interviewed as part of a Danish adoption study of affective disorder conducted by Wender, Kety, Schulsinger, and Lunde; the methodology of their adoption study will be described elsewhere (Wender et al., in preparation). One-hundred seventy-four subjects, or 23% of the total sample of biological and adoptive relatives previously identified by Wender et al., had been personally interviewed, providing a basis for assessing their creativity, psychiatric diagnosis, and other measures used in the present study. Diagnoses for the remaining relatives in the sample were based on formal hospital and clinic records as described by Wender et al. To meet the requirements of the present study, it was necessary to

modify the original adoption study design of Wender et al., so that each subject's family history was based not only on the adoptee to whom the subject was biologically related, but also on all of the subject's other identified biological relatives in the entire sample.

For the interviewed subsample, "blind" consensus diagnoses were made by Wender et al., after interview material had been edited to remove potentially biasing information; a primary and a secondary diagnosis were recorded for each subject using criteria of DSM-II (the second edition of the Diagnostic and Statistical Manual of the American Psychiatric Association). Since DSM-II diagnoses involving a unipolar depressive component are more conservative than their DSM-III counterparts, the original diagnoses were retained. For the present study, subjects were classified as manic-depressive if they received primary or secondary diagnoses of definite or possible manic-depressive illness. The other diagnosis for each of these subjects usually involved another form of affective disorder. Our cyclothymic sample was similarly composed of subjects with primary or secondary diagnoses of cyclothymia; nearly all of these cases had no other recorded psychopathology. Some individuals who might receive research diagnoses of bipolar disorder, type II, according to DSM-III might have been included in this group. Our sample of normal relatives was comprised of interviewed subjects who received no primary or secondary psychiatric diagnosis and were first-degree biological relatives of either manic-depressives or cyclothymes as defined previously. Subjects meeting the respective criteria for these index groups were drawn from

all those previously interviewed by Wender et al.

Our control subjects were composed of all those biological and adoptive relatives of the psychiatrically normal control adoptees, previously identified by Wender et al., who also satisfied our additional screening criteria: these controls could have neither a personal nor a family history of (a) major affective disorder or cyclothymia, (b) possible variants of bipolar disorder (acute schizophrenia, schizoaffective disorder), or (c) suicide. These procedures yielded a sample of 17 manic-depressives, 16 cyclothymes, 11 psychiatrically normal first-degree relatives, 15 control subjects diagnosed as normal, and 18 controls carrying a diagnosis other than those just noted.

Data Base, Data Preparation, and Measures

Subjects were interviewed by a Danish psychiatrist who is fluent in English as well as Danish (I.L.). Results of the interviews were reported in English, in detailed narrative form. Information on lifetime vocational and avocational history was used for assessment of creativity. Vocational history was reported for every subject, typically as a chronological description of activities; avocational information was available for 81% of the immediate study sample of 77 subjects. (This avocational information was unavailable for 5 manic-depressives, 2 cyclothymes, 2 normal relatives, 3 psychiatrically normal controls, and 3 controls carrying a diagnosis). Prior to the rating of creativity variables, all potentially biasing information was edited out of the interview report by a member of the research team

other than the rater. The person responsible for editing materials excluded any references to positive or negative aspects of personality, intellectual functioning, or personal or family psychiatric history. Age, sex, and educational level were recorded directly at this point. Diagnostic data was recorded independently, along with a global intelligence estimate, made on a three-point scale (above-average, average, and below-average intelligence), based on the interviewer's mental status examination. Because subjective ratings of intelligence may be inflated by observed creativity (Barron & Harrington, 1981), it is possible that creativity variance could be erroneously removed when intelligence is partialled out of creativity scores. However, this should not affect the relative (rank-order) standing of the psychodiagnostic groups in this study.

The Lifetime Creativity Scales (LCS)

Characteristics of these scales are summarized here and described in greater detail elsewhere (Richards, Kinney, Lunde, Benet, & Merzel, 1985). The LCS measurement approach departs from the more restrictive views of creative accomplishment, e.g., that such accomplishment has occurred only rarely throughout history (as in the work of a Beethoven or Einstein), or that it occurs more broadly, but only in "traditionally creative" fields such as the arts and sciences. By contrast, in the present study "creativity" is viewed as a quality or capability which varies broadly in the general population, and may be manifested in a wide variety of outcomes involving virtually any field of endeavor (see Richards et al., 1985). This perspective at once bears similarities to

the views on creativity expressed by humanistic psychologists such as Maslow (1959) or Rogers (1959), and to the concept of "phenotypic plasticity" underlying human inventiveness and adaptability that has been described by evolutionary biologists (e.g., Dobzhansky, 1962).

Assessment of creativity by the Lifetime Creativity Scales (LCS) is based on subjects' real-life vocational and avocational activity, as in several previous studies of creativity and psychopathology (Heston, 1966; McNeil, 1971; Andreasen & Canter, 1974). We refined this approach, extended it to encompass all creative activities over the adult years, and removed any requirement that such endeavors be socially recognized. This approach allowed the study of more general populations. Our empirical rationale for broad-based assessment of creativity is based on evidence for a "disposition toward originality" and "core" characteristics of the individual associated with creativity across diverse fields of endeavor (Barron, 1955, 1969; Barron & Harrington, 1981).

There are seven scales in the LCS. These pertain to the quality or quantity of creative accomplishment over the adult lifetime. "Peak creativity" and "extent of creative involvement" are each assessed separately for vocational and for avocational activity. Creativity at work and leisure were distinguished in order to examine expected group differences in emphasis on these two areas. Of relevance here are suggestions (e.g., Akiskal, Hirschfeld, & Yerevanian, 1983) that subjects at risk for bipolar disorder may concentrate their energies disproportionately on work. The LCS also contain summary measures for

peak creativity, extent of creative involvement, and a measure of overall creativity. "Peak" measures are designed to identify the strongest real-life reflections of an underlying "disposition toward originality" (Barron, 1955, 1969), capturing those occasions when personal and environmental conditions for creativity are optimal. The "extent of involvement" scales identify the relative importance of creative vs. other activity during the lifetime and are seen as more responsive to environmental conditions that help or hinder creativity. The Overall Peak Creativity measure was viewed a priori as providing the best test of any fundamental intergroup differences in creative capability; it was therefore the focus of this study, with Vocational and Avocational Peak Creativity serving as supplementary measures.

Two general criteria for creative outcomes are employed, after Barron (1969): (a) that an unusual or novel element be involved (originality criterion), and (b) that outcomes be meaningful to others (criterion of "adaptation to reality"), rather than bizarre and idiosyncratic. "Peak creativity" assessments are each made on six-point scales ("insignificant," "minor," "some," "moderate," "high," and "exceptional" creativity), where the level of "some" creativity is taken as a normative average. Only major enterprises or ongoing areas of activity are considered (e.g., building a house, designing an advertising campaign), so that creative efforts are more likely to reflect true capability rather than chance fluctuations. The significance of innovative elements to a total enterprise is based on the departure of this enterprise from more typical products and

practices. When elaborative detail is lacking (typically the case for vocational activity in this sample), alternative ratings may be assigned, based on detailed standard descriptions of the activity (U.S. Department of Labor, 1977; Kolstrup, 1982). Two consultants on Danish culture helped formulate methods that were valid for a Danish population. A rating guide provides specific criteria for each rating level (see Table 1), along with multiple examples, and is available to the interested investigator for research purposes.

Insert Table 1 about here

Validation data were based on two samples. The first was a nonpsychiatric sample consisting of 185 control subjects from a Danish adoption study of schizophrenia; the second was the full interviewed sample of 174 subjects from the present affective disorder adoption study (see Richards et al., 1985). In each case, data distributions were approximately normal for all scales, consistent with our broad definition of creativity and the scaling implicit in our norm-referenced assessment method. Interrater reliability ranged from good to excellent; it was calculated for ten randomly selected subjects from each sample for all pairs of three trained raters. Mean Pearson product-moment correlations were: for measures of vocational creativity, 0.81 (SD=.13); for measures of avocational creativity, 0.90 (SD=.09); and for the summary measures, 0.94 (SD=.02).

Several lines of validity evidence are available, including: (a)

information on sampling or content validity, (b) results of hypothesis testing involving correlates of adult creativity supported by the literature (childhood creativity, fantasy, appreciation of creativity, and Holland's (1973) primary interest styles), and (c) additional data on construct validity from factor analyses of LCS scales, along with variables for which discriminant validity from creativity was important (Richards et al., 1985).

Consistent factor analytic findings were obtained from both validation samples, based on a principal components solution with varimax rotation. These included: (a) the distinctness of the vocational and avocational creativity measures, each of which defined an orthogonal factor; (b) the strong relationship between peak creativity and the involvement scales within the vocational, avocational, and summary measures; and (c) the distinctness of the intelligence dimension from the creativity factors--with the intelligence rating defining its own factor, while still showing the expected low-positive correlations with the vocational (if not avocational) measures of creativity.

Insert Table 2 about here

These findings are illustrated in Table 2 for the 185 subjects from the nonpsychiatric validation sample. For this analysis, we included a measure of passive "appreciation of creativity," defined as enjoyment (as a spectator or consumer) of other people's creative activities or works in the arts and sciences. Factors I, II, and III are,

respectively, associated with (a) vocational creativity, (b) avocational creativity, and (c) education and socioeconomic status. Passive appreciation of creativity also helps define (d) the intelligence related Factor IV, underscoring the difference between active generation of creative products and the passive appreciation of other's efforts in traditionally creative fields. It is also notable that the control variables of education, intelligence, and socioeconomic status emerge as distinct from the major creativity variables, yet still show the predicted positive but moderately low correlations with them.

Results

Preliminary Analyses

"Residual" Peak Creativity scores were derived by partialling out the effects of age, education, and intelligence from the measure of Overall Peak Creativity. This was done for males and females separately, using all subjects of each sex in the interviewed sample of 174 subjects. "Adjusted" scores were derived for males and females by adding back the grand mean of creativity for each sex. A preliminary 2x5 analysis of Overall Peak Creativity, with diagnostic group and sex as independent variables, showed no significant sex x diagnosis interaction ($F(4,67)=0.68$, $p<.60$), making it possible to partial out a significant main effect of sex ($F(1,67)=8.90$, $p<.005$) favoring males, and to combine males and females for subsequent analyses of both raw and adjusted creativity scores. Descriptive statistics on Overall Peak Creativity, and on the covariates, are shown by group in Table 3. There was no significant diagnostic group-by-sex interaction for either

vocational or avocational creativity. Interestingly, there was another significant main effect of sex for vocational creativity ($F(1,63)=5.76$, $p<.02$) but not for avocational creativity.

Insert Table 3 about here

Major Results: Overall Peak Creativity

Four statistically independent orthogonal contrasts, derived from our hypotheses, tested whether creativity is: (a) higher in all index subjects (manic-depressives, cyclothymes, and normal first-degree relatives combined) than in control subjects lacking risk for affective disorder, (b) higher in cyclothymes than in other index subjects (i.e., than in manic-depressives and normal relatives combined), consistent with an "inverted-U" configuration, (c) different in normal relatives vs. manic-depressives (with no significant difference expected for this contrast, in accord with the "inverted-U" hypothesis), and (d) different in the psychiatrically normal controls vs. those controls who had a diagnosis (again, no difference was expected). One-tailed tests were used for the first two contrasts, since the direction of the effect had been hypothesized, and two-tailed tests were employed for the last two hypotheses. Results are portrayed graphically in Figure 1.

The first contrast was significant ($t=1.78$, $p<.05$) and the third was suggestive ($t=1.70$, $p<.10$), whereas the second and fourth contrasts were nonsignificant. Thus when the two types of control subjects were

compared (i.e., the psychiatrically normal controls and those carrying a diagnosis), there was no significant difference. However, the combined group of index subjects (manic-depressives, cyclothymes, and normal relatives) was significantly higher on Overall Peak Creativity than all control subjects combined. Interestingly, first-degree normal relatives of manic-depressives and cyclothymes were suggestively higher on creativity than the manic-depressive subjects, whereas cyclothymes did not show the significantly higher creativity that was expected when compared to manic-depressives and normal relatives combined. Inspection of Figure 1 suggests why this occurred; normal relatives and cyclothymes were both comparably high on creativity compared to other groups.

When the effects of age, education, and intelligence were partialled out, index subjects remained suggestively higher on creativity than controls ($t=1.31$, $p<.10$). The ranking of group means remained very similar to that in the original analysis (Spearman rank-order correlation of 0.90, $p<.02$), with normal relatives and cyclothymes still showing the highest creativity (see Figure 1).

Insert Figure 1 about here

When the areas of creative activity of all index subjects with "moderate" or higher creativity scores were examined, it was found that vocational activity was divided more or less equally between the arts, sciences, humanities and social sciences, and organizational and leadership roles. By contrast, avocational activity was almost entirely

confined to crafts and the fine arts--perhaps because such hobbies have traditionally been emphasized in Denmark. Activities involving visual content were nearly as prevalent as those involving language, music, and movement combined. A similar pattern appeared in creative controls.

Supplementary Analyses: Vocational and Avocational Peak Creativity

Adjusted scores were developed in the same way for the supplementary as for the primary analyses. Using the same orthogonal contrasts, normal relatives scored significantly higher than manic-depressives on Avocational Peak Creativity ($t=2.57$, $p<.05$), with cyclothymes falling in-between. Inspection of group means revealed that Avocational Peak Creativity tended to vary directly with degree of psychological health, whereas on Vocational Peak Creativity, cyclothymes were significantly higher than the other two index groups combined ($t=1.69$, $p<.05$, one-tailed).

Discussion

A modification of the original "inverted-U" hypothesis can be proposed from the results for Overall Peak Creativity. Creativity may be enhanced, on the average, in subjects showing milder and perhaps subclinical expressions of potential bipolar liability (i.e., the cyclothymes and normal first-degree relatives) compared either to individuals who carry no bipolar liability (control subjects), or to those with more severe manifestations of bipolar liability (manic-depressives). In addition, our supplementary results indicate that cyclothymes and normal relatives may tend to realize their creative potential in different ways. Thus, the avocational findings suggest

that in leisure activities (perhaps because they tend to involve fewer external structures, rewards, or constraints than occupational activities), creativity in subjects at risk for bipolar disorders may vary directly with the level of personal functioning; here, normal relatives show the highest creativity. In contrast, the high vocational creativity of cyclothymes, and the notable differential between vocational and avocational creativity for manic-depressives compared to other groups, complement previous research reporting that a driven, work-oriented temperament may be associated with risk for manic-depressive illness (Akiskal et al., 1983).

For normal relatives, our data suggest that it is a subject's relationship to a manic-depressive or cyclothyme, rather than psychiatric normalcy per se, that predicts for heightened creativity. These results suggest there may be a positive "compensatory advantage" (Kinney & Matthysse, 1978) to genes associated with greater liability for bipolar disorder. The possibility that normal relatives of manic-depressives and cyclothymes have heightened creativity may have been overlooked because of a medical-model orientation which focuses on dysfunction, rather than positive characteristics of individuals. Such a compensatory advantage among the relatives of bipolar individuals could affect a relatively large segment of the population.

The finding of enhanced creativity in cyclothymes is consistent with results on eminent creative persons (Andreasen & Canter, 1974; Jamison, in press), but extends this association more broadly to the general population. Use of our general lifetime measure of creativity

made it possible to examine this question. Previous work can be interpreted to suggest a higher prevalence of bipolar disorder type II (Andreasen & Canter, 1974; Jamison, in press) as well as type I (Juda, 1949) among eminent creators. The present findings on manic-depressives do not contradict findings from previous research, since this study was the first to investigate relationships between creative accomplishment and psychopathology in subjects initially identified by psychodiagnostic criteria rather than by creativity; these two research designs are very different (Richards, 1981). Moreover, different bipolar presentations (e.g., those varying in frequency and severity of manic and depressive phases) may carry different consequences for creativity.

It is notable that eminent artists and writers have described hypomanic symptomatology during intense creative periods (Jamison, in press), and that manics have attributed both immediate and lasting effects on creativity to hypomanic episodes (Jamison, Gesner, Hammen, & Padesky, 1980). It will be important to distinguish between potential "state" vs. "trait" characteristics that may enhance creativity. It would be fortuitous if one such trait led to discovery of a biological marker which could track inherited bipolar liability through a pedigree in clinically unaffected as well as affected relatives. In addition, there would be major clinical implications if genotype-environment interactions could be identified which lead to enhanced creativity. Positive intervention might then not only prevent the development of bipolar disorders, but also foster creative talent and productive contribution to society.

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Author Notes

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Table 1

Definitions of Levels of Two Creativity Scales

Levels for Peak Creativity
(0)--"No Significant": Routine or proscribed endeavors with negligible innovative aspects.
(1)--"Minor Degree": Small unexceptional departures from routine or proscribed endeavor.
(2)--"Some": Greater innovativeness, but not unusual in the population.
(3)--"Moderate": Presence of central innovative elements which stand out in the population, although not markedly; these may involve major modifications of common practices or products.
(4)--"High": Presence of markedly distinctive innovative elements which set endeavors well apart from others in the population.
(5)--"Exceptional": Radical departures from the commonplace; these may require conceptual reorganization to be assimilated.
Levels for Extent of Creative Involvement
(0)--"No Significant": Highly proscribed or routine patterns of

lifetime activity.

(1)--"Minor Degree": Proscribed or routine patterns, broken by brief, rare instances of innovative activity.

(2)--"Some": Greater extent of innovative activity than above, but not unusual in the population, and other activity tends to predominate.

(3)--"Moderate": Notable innovative activity in a pattern that tends to admix this with other forms of endeavor.

(4)--"High": Markedly distinctive emphasis on innovation--a dominant life theme and primary commitment.

(5)--"Exceptional": Intense, pervasive, and perhaps compulsive preoccupation with innovative activity over time to the virtual exclusion of other emphases.

Table 2

Factor Analysis Indicating Major Creativity Scales are Distinct from Other Variables in an Independent Nonpsychiatric Validation Sample

Measures	Factors I	II	III	IV	h^2
1. Vocational Peak Creativity	89				91
2. Vocational Extent of Creativity	78		35		81
3. Avocational Peak Creativity		81			80
4. Avocational Extent of Creativity		78			75
5. Overall Peak Creativity	65	53		32	82
6. Overall Extent of Creativity	57	62	36		87
7. Overall Creativity	65	60	32		90
8. Intelligence Rating				51	49
9. Educational Level			58	39	38
10. Socioeconomic Status			55		42
11. Appreciation of Creativity				56	35

Note: Principal components solution with varimax rotation, using 185 control subjects from an independent adoption study of schizophrenia. Only loadings >.30 are reported; decimal points are omitted for all figures.

Table 3

Creativity and Demographic Variables on Five Diagnostic Groups

Group	N	Peak Creativity[a]		Adjusted Peak Creat.[b]		Age		Educational Level		Intelligence Estimate	
		M	SD	M	SD	M	SD	M	SD	M	SD
MDI[d]											
Males	5	2.60	.89	2.30	.72	42.0	16.4	12.20	5.76	1.40	.55
Females	12	2.08	.90	2.08	.74	47.3	16.1	9.83	2.79	.92	.29
Both Sexes[c]	17	2.30	.87	2.20	.72						
Cyclothymes											
Males	8	3.13	.83	2.78	.62	51.6	15.4	9.38	3.70	1.63	.52
Females	8	2.50	.53	2.37	.56	52.0	19.0	9.38	3.02	1.13	.35
Both sexes	16	2.79	.69	2.55	.57						
Normal Relatives											
Males	7	3.29	.49	3.00	.36	46.3	17.0	11.71	4.31	1.44	.53
Females	4	2.25	.96	2.22	.88	38.5	7.2	10.25	1.89	1.00	.00
Both sexes	11	2.83	.72	2.63	.59						
Normal Controls											
Males	5	2.80	1.30	2.73	.75	48.8	21.1	10.60	2.51	1.20	.84
Females	10	2.10	.74	1.97	.79	54.3	25.6	8.80	2.90	1.20	.42
Both sexes	15	2.38	.92	2.27	.77						

Controls with a Diagnosis											
Males	10	2.30	.67	2.29	1.07	53.7	20.7	9.02	3.40	1.20	.63
Females	8	2.25	.89	2.22	.73	56.9	18.0	8.00	1.07	1.13	.35
Both sexes	18	2.23	.78	2.21	.93						

a. Overall peak creativity (raw scores).

b. Overall Peak creativity (scores adjusted for the effects of age, education, and intelligence).

c. The effects of sex have been partialled out.

d. MDI = Manic-depressives.

Figure Caption

Figure 1. Mean Overall Peak Creativity scores, for (a) controls with a diagnosis (DX), normal (NL) controls, (c) normal first-degree biological relatives of cyclothymes and manic-depressives (NL REL), (d) cyclothymes (CYCLO), and (e) manic-depressives (MDI).

MEAN CREATIVITY IN SELECTED DIAGNOSTIC GROUPS